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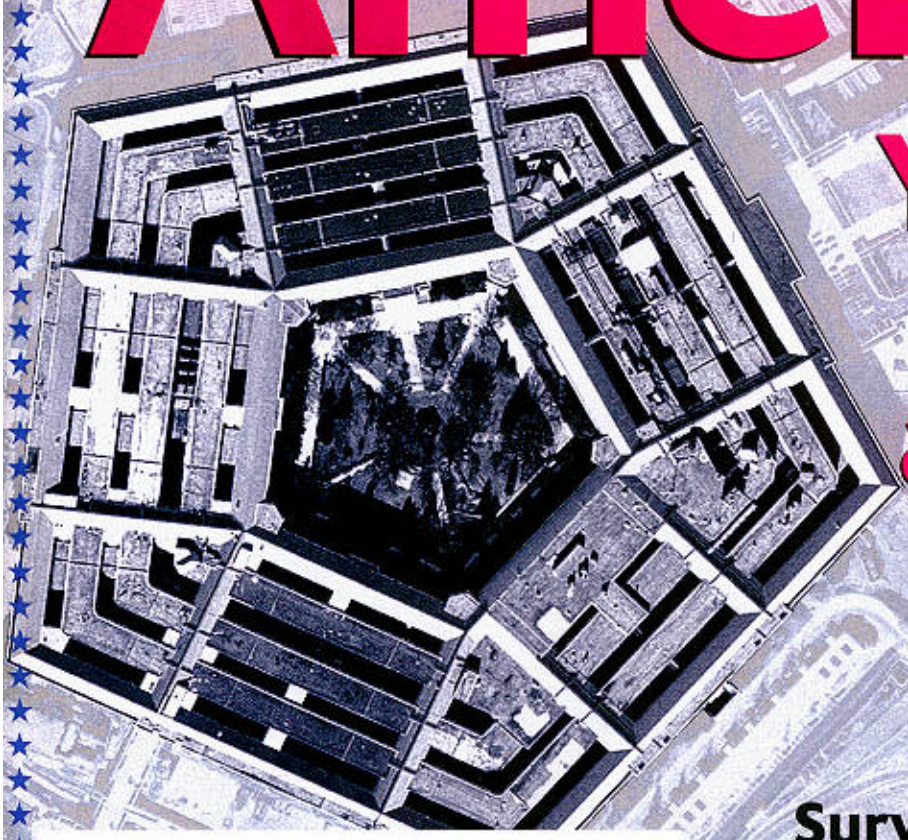

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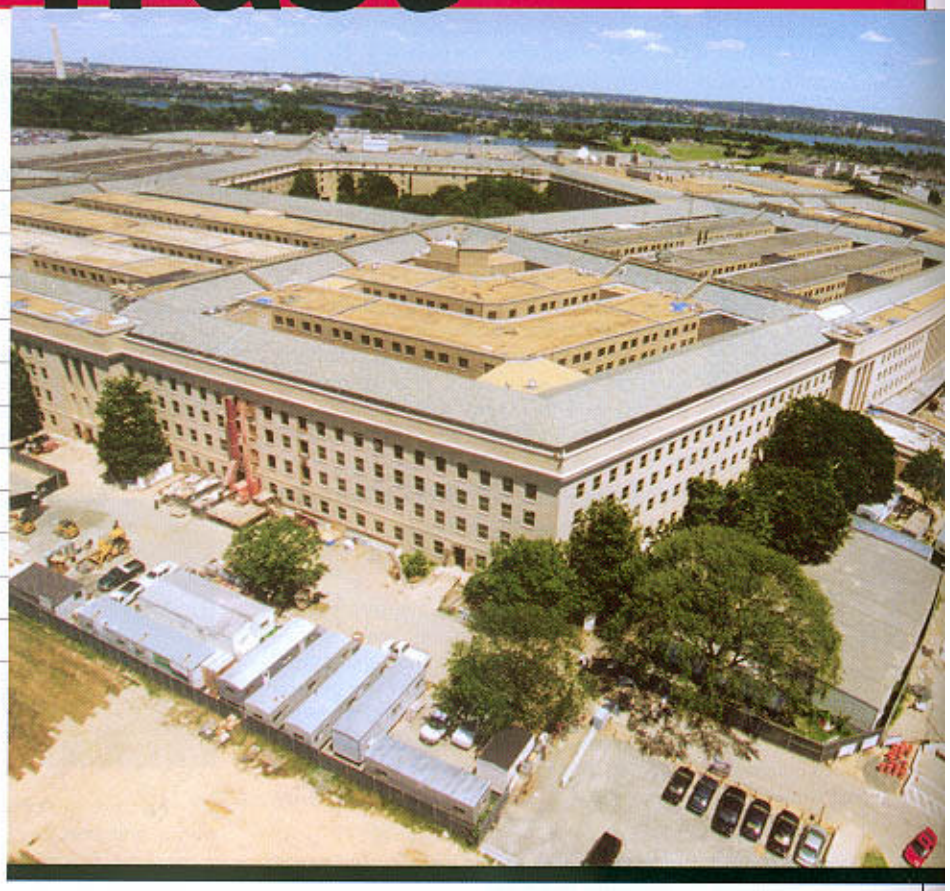
By Clara M.W. Vangen

At street-level, it looks like any other large building – although distinctive, due to its design: Five concentric, pentagonal rings connected by 10 radial corridors. But, for millions of people flying into and out of the nation's capital each year, the aerial view of the Pentagon is an unmistakable and impressive symbol of the history of our American armed forces.



The Pentagon's distinct five-sided shape makes it one of the most recognized buildings of our time. The building itself covers 29 acres and is larger in square footage than three Empire State Buildings.

Now, 58 years later and with an investment proposed to exceed $1 billion, the Pentagon its undergoing its first-ever renovation.

Built in 1943, the Pentagon is the command and control center for our nation's military and headquarters to the senior military leadership, which includes the Secretary of Defense, the Chairman of the Joint Chiefs of Staff, and the heads of each branch of the armed services: Army, Navy, and Air Force.

The Defense Authorization Act of FY1991 transferred ownership of the Pentagon from the U.S. General Services Administration (GSA) to the Secretary of Defense. Under the same Act, Congress established the Pentagon Reservation Maintenance Revolving Fund for the expressed purpose of renovating the Pentagon. This Act also enabled the Secretary of Defense to establish rent rates to support the renovation.

The extent to which the Pentagon has deteriorated is no secret. Rats in the basement, falling ceiling tiles, power surges and outages, and much more had become the norm, rather than the exception. The good news is that the steps being taken to repair and improve the Pentagon (1990-2011) are both cost effective and innovative.

Contract awards, which were negotiated between the government and the contractor, are based on best value to the taxpayer and the government – not necessarily the lowest proposed cost. Best-value determination is based on an analysis of factors including past performance, management approach, technical approach, probable cost, and support of small and disadvantaged businesses. Oral proposals and page limits on proposals reduced the bid time and helped gain additional insight into each contractor's specific capabilities.

"The primary goal of the renovation is to simply bring the building up to standard with current health, fire, and life-safety codes; provide reliable electrical/mechanical and heating, ventilating, and air-conditioning (HVAC) systems; improve security in and around the building; and make the building more accessible to persons with disabilities – all while preserving the building's historical integrity," says Tom Fontana, public affairs team leader for the Pentagon Renovation Program.

Taking Command

Phase I of the renovation (commencing in the early 1990s) began with the replacement of miles of electrical/mechanical, voice/data/cabling (VDC), and HVAC systems. This required the construction of a new heating and refrigeration plant located near the Pentagon. The complete removal of all mechanical, electrical, and plumbing systems was necessary due to the widespread presence of asbestos throughout the building. At the same time, a center courtyard tunnel was constructed to house the new utility lines.

New engineered systems, a sprinkler system, vertical transportation, cable management systems, a flexible ceiling, and lighting, as well as improvements in fire and life-safety systems and state-of-the-art information management and telecommunications (IM&T) that support VDC and other types of communications, were also part of the considerations during this phase of the project.

Additionally, part of the renovation program included the commissioning – the process of verifying and documenting the performance of building systems according to the design and the owner's functional and operational needs – of all electrical/mechanical and plumbing systems. Commissioning of these systems began in the design stage and will extend through the construction process and warranty period.

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Fifty-eight years after it was constructed, the Pentagon will finally have elevator/escalator banks that span all five floors in each of the five corridor rings. Vertical transportation by Schindler Elevator Corp.

Running the Drill

Begun in 1994, Phase II of the renovation relocated the DiLorenzo TRICARE Health Clinic, which opened in February 2000, to what was formerly the motor pool located directly below the River Terrace of the Pentagon building. This state-of-the-art healthcare facility offers a full range of pharmaceutical, radiology, cardiology, dental, audiology, laboratory, physical therapy, podiatry, dermatology, surgical, and general emergency and wellness healthcare services. The clinic relies heavily on the use of telemedicine to provide top-quality medical diagnostic and treatment services to the thousands of tenants at the Pentagon.

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Heavily reinforced columns rise on the site of the Remote Delivery Facility located near the Mall Terrace of the Pentagon.

Mobilizing the Unit

Since the Pentagon was designed as a series of five, five-sided corridor rings, each inside another and each five stories in height, Phases III though VII of the project further divides the Pentagon into five separate wedges. Each wedge – 1 million square feet in size – encompasses one full corner segment of the building measuring from the center of the next side. Each will affect the relocation of 5,000 employees (totaling 25,000 personnel) to one of three office buildings within a three-mile radius of the Pentagon. Additional swing space within the renovated basement and Mezzanine levels of the building has been created in and around the Pentagon to minimize the costs associated with leasing external space. Over a three-year period prior to the start of the Pentagon modernization, 45 floors of ancillary office space were renovated to accommodate mission-specific needs and security requirements.

Phase III – modernization of the "first wedge" of the structure, but reflective of the subsequent phases – began with the addition of pile foundations, under-slab vaults, tunnels, piping, and other work not visible to the outside world. Steel framework and blast-resistant fiber mesh were added to the interior shell of the building, along with blast-resistant windows. (Interestingly, very little steel was used in the original construction of the Pentagon, due to the material's collection and use during World War II.)

Wide corridor ramps, once used to transport officials in jeeps and pedestrian traffic throughout the Pentagon, have been replaced with modern elevator and escalator banks. In fact, the new vertical transportation system allows tenants direct access between all five floors at the corner intersections of each of the five corridor rings. "One general's response to the new vertical transportation system was that people wouldn't have to go all the way to the roof to jump anymore," jokes Fontana, whose commitment and passion for the project are evident in the pace he keeps and the wealth of information he projects.

Prior to the renovation, outdated and unsafe freight elevators transported both persons with disabilities and bulky cargo from one floor to the next. "Every year we had several people who were injured using these elevators," explains Fontana. "They were very dangerous to use for anything other than freight. Unfortunately, [at the time,] there weren't any other options for these people."

Raised flooring and fiber-optic cable are installed in the new technical facility located in the basement.

Skylights installed at the corners of the first-floor level bridge each corridor ring for a seamless transition from one to the next. At each juncture sits a well-lit cafeteria area and ample space for dining. The steep ramps that once occupied this space have been removed and the space converted into additional offices.

Flexible office systems furniture, including a spinewall workstation configuration, provides easily accessible raceways for telecommunications. This set-up also allows for maximum flexibility in the initial furniture layout, as well as future reconfigurations. Conveniently located electrical and telecommunications closets, in addition to raised flooring, fiber-optic cable, and desktop portals, are just a few of the tenant amenities that now provide high-speed VDC and other services.

Phase III "Wedge I" included:

- 1 million square feet of the building space.
- 1,500 new energy-efficient windows.
- 5,000 personnel relocated to swing space.
- 15 million pounds of debris removed.
- 4 million pounds of asbestos removed.
- 25 truckloads of lead waste were removed.
- 70 percent of removed materials were recycled.
- Installation of escalators and elevators.
- New energy management control systems.
- New heating and cooling system.
- New telecommunications infrastructure.
- Items with any salvage value were sold with proceeds reverting back to the government.

Flexible office systems furniture replaces dated, worn, and inefficient workstations. All voice, data, and communications ports are located at desktop level.

Calling for Reinforcements

Ancillary areas on the grounds are a large part of increasing security in and around the Pentagon. They included:

- Two pedestrian bridges connect to the 2nd floor of the Pentagon at

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the Corridors 2 and 3. These bridges provide separation of vehicular and pedestrian access, improving security at the Pentagon and easing traffic congestion along Rotary Drive. Two elevators in each bridge provide access to the Pentagon for persons with disabilities.

- All incoming tractor-trailers and other delivery trucks are now rerouted to the new Remote Delivery Facility (RDF) located north of the Mall Terrace, which serves as a secure screening/checkpoint facility for all items entering the building.
- A bypass lane for authorized vehicles is complete with crash bollards, cardreaders, and a gate arm for added security.
- On any given day, 16,000 employees enter the building from the Metro Terrace. Thousands more use the station as a transfer point. For security reasons, the new Metro Entrance Facility (MEF) has also been relocated some 400 yards away from the building. The relocation is expected to improve the circulation of buses entering and exiting the area, as well as the visual and physical appearance of the MEF to the Pentagon.
- Improvements and repairs to the existing heliport fire station and heliport control tower will bring the operations of these facilities up to the standards of the Pentagon.

The Pentagon Renovation Project is about much more than new carpet and fresh paint on the walls. This project represents a new area in our government and our armed forces. It's about taking a giant step forward in maintaining our status as a world leader in military technology, security, and intelligence. **B**

Clara M.W. Vangen **(clara-vangen@buildings.com)** *is technologies editor at Buildings magazine.*

Writer's Corner...

I stood on the tarmac outside of the Pentagon and watched military personnel shuttle in and out of the great building. Thinking that perhaps it was my Midwestern upbringing or the flashback of being frightened to tears that my older brothers would be drafted and sent to Vietnam, I was totally in awe of my surroundings.

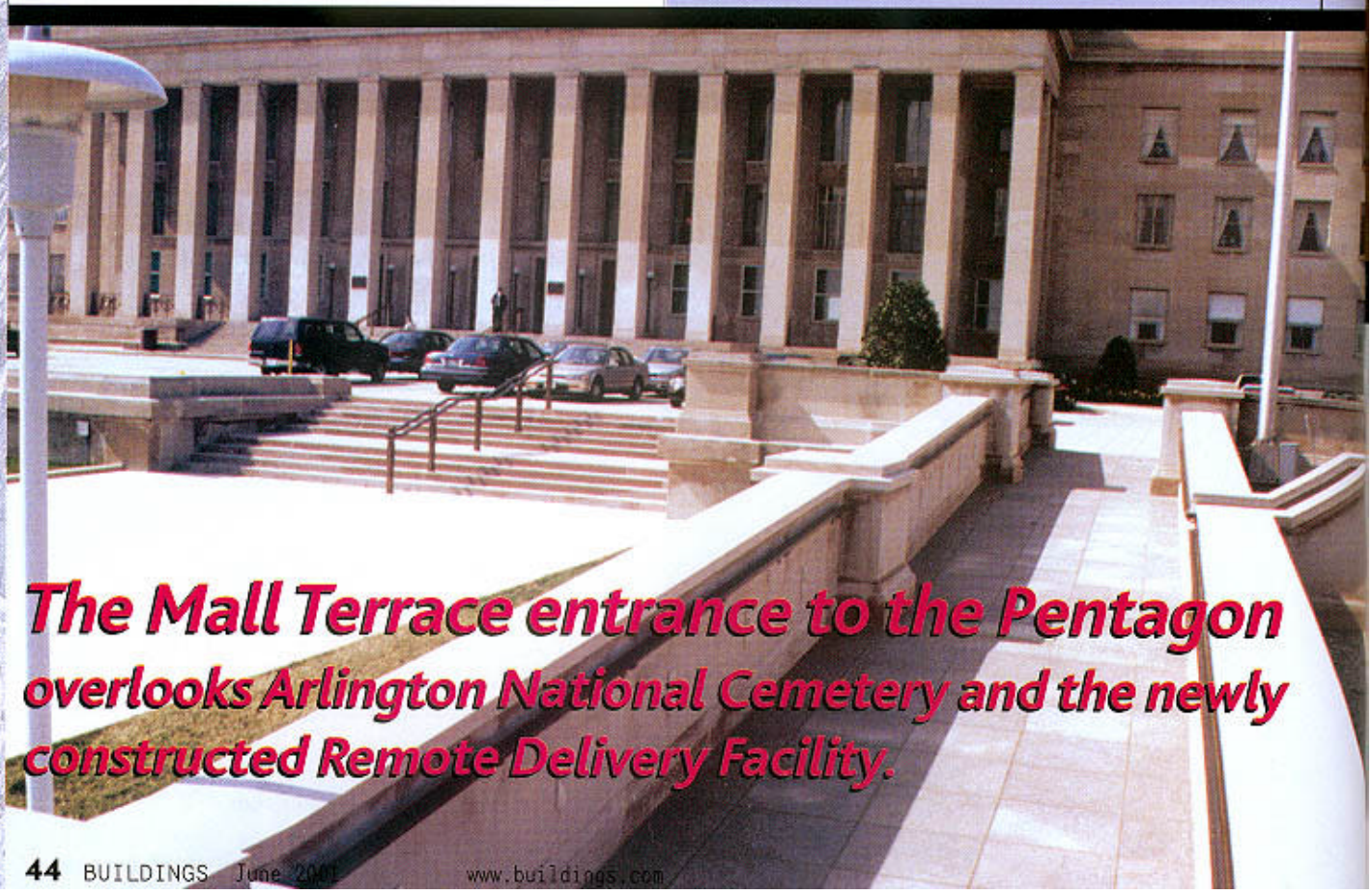
As I toured the hallowed halls of the Secretary of Defense, the Chairman of the Joint Chiefs of Staff, and the heads of each branch of our military, I could almost hear the roar and hush of history being made as war was declared by strong men in heroic form.

I stood at the podium in the Press Room for the Department of Defense, where important government officials make life-changing announcements. Farther down the hall, I saw the ABC, CNN, and other network press closets where I envisioned television and newspaper personalities scrambling to be the first to report on the day's events during the Gulf War and, more recently, the downing of a military aircraft in China.

As a young American student, I was taught to say the "Pledge of Allegiance," and sing the words to our National Anthem, "The Star Spangled Banner." As an adult woman and member of the American Legion Auxiliary, Hanford Unit No. 5, I have a great sense of pride in our country's military history. Now, with the renovation of the Pentagon, there is also a pride in the level of commitment to excellence on the part of our government and our taxpayers to invest in our strategic military future.

In all honesty, though, the highlight of the day for me was getting into the cab and asking the driver to please, "Take me to the Pentagon." I may never have the opportunity to utter those words again in my lifetime, but for that one brief moment, I was never more proud to be an American.

— Clara M.W. Vangen, Technologies Editor, *Buildings*



The Mall Terrace entrance to the Pentagon overlooks Arlington National Cemetery and the newly constructed Remote Delivery Facility.